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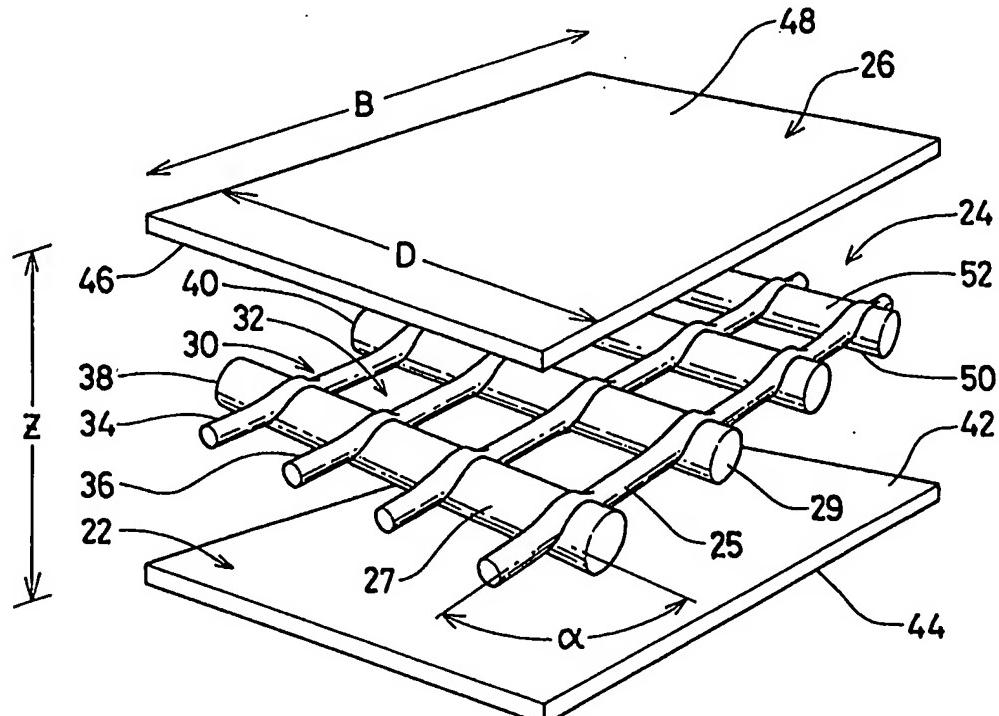
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(54) Title: EXTENSIBLE LAMINATE STRUCTURES



## (57) Abstract

A laminate structure elastically extensible in at least one direction is disclosed. The laminate structure is provided with a first coverstock layer (22), a second coverstock layer (26) and an elastomeric layer (24) joined between the first and second coverstock layers and along edge regions thereof to provide side anchor zones along edge regions of the laminate structure.

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## EXTENSIBLE LAMINATE STRUCTURES

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### FIELD

The present invention relates generally to the field of laminate structures. More  
15 particularly, the present invention relates to extensible laminate structures that can be  
incorporated into disposable absorbent garments.

### BACKGROUND

20 Laminate structures have previously been used in a variety of products, including elastic absorbent articles such as sweat bands, bandages, diapers and incontinence devices. Examples of laminate structures that have been previously used include composites made from a gatherable material joined to an elastic web, composites made from mesh, tissue and microfibers, as well as composites made from  
25 a central elastic layer, a breathable material, and an adhesive layer. Examples of such laminates are described in U.S. Patent No. 4,522,863 to Keck et al. and U.S. Patent No. 4,977,011 to Smith.

30 Laminate structures have been used in disposable pull-on garments that are donned by inserting the wearer's legs into the leg openings and sliding the garment up into position about the lower torso. Examples of such pull-on garments include disposable underwear, pull-on diapers, training pants, and disposable panties for menstrual use. Such garments are often worn by infants and other incontinent individuals to receive and contain urine and other body exudates. Examples of these  
35 types of pull-on garments are disclosed in U.S. Patent No. 5,171,239 to Igaue et al., U.S. Patent No. 4,610,681 to Strohbeen et al., WO 93/17648 published on September 16, 1993, U.S. Patent No. 4,940,464 to Van Gompel et al., U.S. Patent No. 5,246,433 to Hasse et al., and U.S. Patent No. 5,569,234 to Buell et al.

Disposable pull-on garments having fixed sides (e.g., training pants or pull-on diapers) have become popular for use on children able to walk and often who are toilet training. In order to contain body exudates as well as to fit a wide variety of body shapes and sizes, these pants must fit snugly about the waist and legs of the wearer without drooping, sagging or sliding down from position on the torso, as well as accommodate larger wearers without causing irritation to the skin due to the product being too tight. Thus, the pant must have elastic extensibility in the waist and legs with the elastic features providing a high degree of stretch. Extensible side panels, including side panels formed from a stretch laminate, have previously been used to provide a degree of stretchiness in the side areas of such garments.

However, pull-on garments provided with conventional extensible side panels typically, when under stretch, have a tendency to sag, droop, or slide down the wearer's body. This is particularly true if the extensible side panels have been formed from a laminate structure. When strained over an interval of time, i.e., during the wearing cycle (the time period that the garment is worn), the layers of the laminate structure may move relative to one another. Such relative movement is known as "creep" and generally results in reduction of the holding forces generated in the side panel. In addition, the layers of the laminate structure may become delaminated under shear forces generated during the wearing cycle, which also causes the holding forces generated in the side panels to decrease. Such reduction in these holding forces typically leads to sag, droop, or sliding down, and thus the likelihood that body exudates may not be adequately contained and leakage may occur. In addition, a garment that experiences sag, droop or sliding down is generally less comfortable for the wearer and unacceptable to the consumer.

In addition, conventional side panels have generally required trade-offs between performance characteristics, such as breathability, soft feel for the wearer, application force, and sustained contractive forces. In order to improve performance in one area, performance in another area has typically been compromised. For example, conventional side panels requiring a high degree of stretch at application of a diaper (e.g., about 200%) require low application forces to be acceptable to the consumer. However, at lower levels of side-panel stretch that are typical during the wearing cycle (e.g., about 50%) such side panels exhibit sustained contractive forces that are too low to prevent diaper sag.

Additionally, conventional side panels that can strain up to 150%-200% during a diaper wear cycle typically create shear forces upon the laminated elastic elements that cause delamination and creep from the fabric or material elements.

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Based on the foregoing, there is a need for an extensible laminate structure that substantially eliminates creep and delamination, thereby substantially eliminating sagging, drooping, and sliding down of a garment that incorporates such a laminate during wear, and which necessitates no performance trade-offs. None of the existing 10 laminate structures or pull-garments provide all of the advantages and benefits of the present invention.

### SUMMARY

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The present invention is directed to a laminate structure elastically extensible in at least one direction, comprising a first coverstock layer; a second coverstock layer; and an elastomeric layer joined between the first and second coverstock layers and along edge regions thereof to provide side anchor zones along edge regions of the 20 laminate structure.

These and other features, aspects, and advantages of the invention will become evident to those skilled in the art from a reading of the present disclosure.

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### BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description which is taken in conjunction with the accompanying drawings, in which like designations are used to designate substantially identical elements, and in which:

Figure 1 is an exploded view of the layers of a preferred embodiment of the 35 laminate structure of the present invention prior to being formed into a laminate

structure;

Figures 2A and 2B are fragmentary side views of a laminate structure made in accordance with the present invention;

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Figures 3A-3C are enlarged views of a portion of the laminate structure of Figure 2 at various stages during the formation of the laminate structure;

Figure 4 is a top view of a portion of the laminate structure shown in Figures 1-  
10 3;

Figure 5 is a schematic representation of a preferred process for forming the laminate structure of Figures 1-4;

15 Figure 6 is a perspective view of a typical disposable pull-on garment incorporating the laminate structure of the present invention in a typical in-use configuration; and

20 Figure 7 is a cross-sectional perspective view of a portion of the pull-on garment shown in Figure 6.

#### DETAILED DESCRIPTION

25 All references cited herein are incorporated herein by reference in their entireties. Citation of any reference is not an admission regarding any determination as to its availability as prior art to the claimed invention.

30 Figure 1 is an exploded view of the components of a preferred embodiment of the laminate structure 20 prior to formation (a preferred embodiment of laminate structure 20 after formation is shown in side view in Figure 2). The laminate structure 20 is formed from a first coverstock layer 22, a elastomeric layer 24 that has a plurality of first strands 25 and a plurality of second strands 27, and a second coverstock layer  
26.

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The laminate structure 20 preferably has at least one structural direction D, wherein at least a portion of the structural direction D is elastically extensible. More preferably, the laminate structure 20 provides the structural direction D along the direction and entire length of the second strands 27. A structural direction B is 5 provided along the direction and entire length of the first strands 25 and is substantially perpendicular to the structural direction D. A structural direction z is further provided and is defined as the direction extending through the thickness of the laminate 20.

Although it is preferred that the laminate structure 20 provide at least one 10 structural direction D that is elastically extensible, it is further contemplated that the laminate structure 20 can be inelastic such that no elastically extensible structural directions are provided. Alternatively, the laminate structure 20 can also be provided with a structural direction over which a portion of the length thereof is elastically extensible and a portion of the length thereof is inelastic. As used herein, "elastically 15 extensible" means a segment or portion that will elongate in at least one direction (preferably the lateral or structural direction D) when tensional forces are applied, and will return to about its previous size and configuration when the tensional forces are removed.

Referring to Figure 1, the elastomeric layer 24 is provided with a plurality of 20 first strands 25 that intersect a plurality of second strands 27 at nodes 30 at a predetermined angle  $\alpha$ , forming a net-like open structure having a plurality of apertures 32. Each aperture 32 is defined by at least two adjacent first strands (e.g., 34 and 36) 25 and at least two adjacent second strands (e.g., 38 and 40), so that the apertures 32 are substantially rectangular in shape. Other configurations of the apertures 32, such as parallelograms, squares, or circular arc segments, can also be provided. Preferably, the first and second strands 25 and 27 are substantially straight and substantially parallel to one another. Preferably, the first strands 25 intersect the second strands 27 at nodes 30 such that the angle  $\alpha$  is about 90 degrees. The first and second strands 25 30 and 27 are preferably joined or bonded at nodes 30.

Preferably, the elastomeric layer 24 is an elastomeric scrim material. A 35 preferred elastomeric scrim is manufactured by the Conwed Plastics Company under the designation TN2514. This material has 12 elastic strands per inch in the structural direction B (i.e., the first strands 25) and 7 elastic strands per inch in the structural

direction D (i.e., the second strands 27). Other preferred materials for use as the elastomeric layer 24 include perforated films and elastic strands, where the elastic strands may be laid in either or both of the structural directions B and D, or may run in a continuous linear fashion across the coverstock layer from side to side (creating a  
5 continuous elongated "S" type pattern). Alternatively, other elastomeric materials such as "live" synthetic or natural rubber, other synthetic or natural rubber foams, elastomeric films (including heat shrinkable and apertured elastomeric films), elastomeric woven or nonwoven webs, elastomeric composites, or other such materials as are known to the artisan may be used. However, typical film elastic materials and  
10 other elastomeric layers tend to occlude vapor transmission through the laminate structure, which may decrease breathability.

The first coverstock layer 22 has an inner surface 42 and an outer surface 44. The inner surface 42 of the first coverstock layer 22 is the surface that is positioned facing the elastomeric layer 24. The second coverstock layer 26 also has an inner surface 46 and an outer surface 48. The inner surface 46 of the second coverstock layer 26 is the surface that is positioned facing the elastomeric layer 24. The  
15 elastomeric layer 24 also has two planar surfaces, first surface 50 and second surface 52 (more clearly shown in Figure 2A), each of which is substantially parallel with the planes of the first and second coverstock layers 22 and 26. The first surface 50 is that planar surface of the elastomeric layer 24 that is most closely adjacent with the inner surface 42 of first coverstock layer 22. The second surface 52 is that planar surface of elastomeric layer 24 that is most closely adjacent to the inner surface 46 of the second coverstock layer 26.  
20

Since the laminate structure 20 will be subjected to mechanical stretching during use, the first and second coverstock layers 22 and 26 are preferably elongatable, more preferably drawable (but not necessarily elastomeric), without undue, and preferably without any, tearing or ripping. Further, because the typical uses contemplated for the  
25 laminate 20 involve incorporation into articles that will contact a wearer's skin, the first and second coverstock layers 22 and 26 are preferably compliant, soft feeling, and non-irritating to the wearer's skin and give the article the feel and comfort of a cloth garment. Suitable materials can be manufactured from a wide range of materials such as plastic films, apertured plastic films, woven or nonwoven webs of natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyolefins, polyamides, polyester,  
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polyethylene, or polypropylene fibers), or a combination of natural and/or synthetic fibers, or coated woven or nonwoven webs.

Preferably, each of the first and second coverstock layers 22 and 26 is an  
5 identical consolidated nonwoven material. An exemplary preferred nonwoven material  
is manufactured by the FiberWeb Company under the designation Sofspan 200. This  
material has a basis weight of 25 g/m<sup>2</sup> before consolidation. As used herein, "basis  
weight" is the weight of one square meter of planar web material. Alternatively, highly  
strainable nonwoven materials may be used. Alternatively, the first and second  
10 coverstock layers 22 and 26 need not be of identical materials, as long as the desired  
performance requirements, such as elastic performance, softness, flexibility,  
breathability and durability, are met. As used herein, "consolidated nonwoven  
material" means a nonwoven material that has been gathered or necked under  
mechanical tension in the structural direction D so that the material can elongate in the  
15 structural direction D under low force.

The laminate structure 20 is preferably formed by positioning the elastomeric  
layer 24 between the first coverstock layer 22 and the second coverstock layer 26, as  
shown in Figure 1, and adhesively bonding the three layers using the bond patterns as  
20 described below. Although preferred embodiments of the present invention are  
described herein with reference to a laminate having three layers it will be apparent to  
those of skill in the art that the laminate structures of the present invention are not  
limited to those having three layers. In addition, it will further be apparent to those of  
skill in the art that the side anchor zones of the laminates of the present invention are  
25 not limited to those having been formed from one, two, or three adhesive applications,  
but rather may be formed by any means known to the artisan.

Thus, although variations in the number, type and order of application of the  
adhesives that are used to form the laminates of the present invention are within the  
30 scope of the present invention, preferably at least a first adhesive is applied to the inner  
surface of at least one of the coverstock layers to create the side anchor zones A along  
edge regions of the laminate structure 20, as described more fully below.

A fragmentary enlarged side view looking into the structural direction B of the  
35 laminate 20 is shown in Figure 2A. It has been found that when the laminate 20 is

bonded or otherwise anchored such that side anchor zones A are created, such a laminate 20 is both highly elastic and substantially free from delamination and creep, while providing very good performance characteristics in all performance categories with no trade-offs between any performance characteristics required. The side 5 anchoring is preferably performed by side gluing with adhesive beads to anchor the elastomeric layer between the coverstock layers as a part of the lamination process, as described more fully below. Alternatively, side anchoring may be performed by sewing, heat sealing, ultrasound bonding, needle punching, alternative gluing processes, or by any other means known to those skilled in the art. Another alternative 10 is to side anchor the layers of the laminate structure after the lamination of the elastomeric and coverstock components has been performed.

The laminates of the present invention may particularly provide very good soft feel for the wearer and for the consumer. This is important because consumers value 15 softness. In conventional laminates, the attempts to eliminate creep have frequently required an unacceptable decrease in softness, often accompanied by an unacceptable decrease in the ability to activate. This is because such previous attempts (which have fallen short of eliminating creep) have focused on the application of additional melt blown adhesive, often in an overall coating pattern, in the attempt to strengthen the 20 bonds. This has generally resulted in an undesirable overall stiffening of the laminate. However, the laminates of the present invention provide elimination of creep without the loss of consumer-desired soft feel and without compromise of activation ability.

Referring to Figure 2A, a first adhesive 70 (not separately shown in the 25 Figures) is applied to the inner surface 46 of the second coverstock layer 26 in positions that correspond to each of the outer edges 80 of the laminate structure 20. The first adhesive 70 may alternatively or additionally be applied to the inner surface 42 of the first coverstock layer 22. For ease of illustration, the description and Figures refer to application to the second coverstock layer 26 only.

30

This pattern creates side anchor zones A, which substantially eliminate the delamination and creep associated with previously known laminates and which allows the laminate 20 to experience higher strains without creeping or delaminating. It has also been found that confining the first adhesive 70 to the edge areas 80 of the laminate 35 structure 20 avoids impeding the extensibility of the laminate 20 and also avoids tears

in the coverstock layers 22 and 26. Preferably, the first adhesive 70 is applied as a plurality of beads 68, as shown in the Figures. Preferably, the first adhesive 70 is a flexible adhesive with an amorphous and crystallizing component. Such a preferred adhesive is made by the Findley Adhesive Company under the designation H9224.

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Figure 4 is a simplified view of the laminate 20 showing the locations of the side anchor zones A created by the beads 68, and the area of comparatively higher extensibility S that exists in the central area of the laminate 20. For ease of illustration, the second coverstock layer 26 is shown in phantom lines, and the elastomeric layer 24 is shown superposed on the second coverstock layer 26. The zones A depicted in the Figures are exemplary, and it will be understood by those of skill in the art that these side anchor zones A may accommodate varying design needs, for example with respect to exact location, width, or spacing, and are not limited to those shown in the Figures. Figure 4 also illustrates preferred positions of the beads 68 substantially within the apertures 32 of the elastomeric layer, which contributes to the integrity of the side anchor zones A for the reasons described more fully below.

Upon application, each of the beads 68 is preferably absorbed in the z direction, i.e., into the thickness of, the second coverstock layer 26, where it encases the fibers of the coverstock layer in the area of application. Figure 3A is an expanded view of a portion of the laminate 20 showing the position of a glue bead 68 after initial application to the inner surface 46 of the second coverstock layer 26. Preferably, multiple beads 68 are applied so as to be continuous in the structural direction B. The beads 68 are preferably applied at a level of about 0.5 to about 3.5 milligrams per linear inch per bead, more preferably at about 1.5 milligrams per linear inch per bead. Figure 3A also illustrates the preferred positions of the beads 68 substantially within the apertures 32 of the elastomeric layer. Another alternative application method for beads 68 is zone coating.

Before the adhesive bead 68 has set, it is preferably nipped, whereby the portions of the beads 68 that show through the elastomeric apertures 32 come into contact with the inner surface 42 of the first coverstock layer 22. If the nip pressure N is sufficiently high, the adhesive of bead 68 will flow into the matrix of first coverstock layer 22. Figure 3B shows a typical position of a glue bead 68 during nipping. During nipping, the first and second strands 25 and 27 of the elastomeric layer 24 (only first

strands 27 are shown in Figure 3B) also undergo compression. However, when the nipping pressure N is removed, strands 25 and 27 return to their original configurations.

5 After the beads 68 have set, the first and second coverstock layers 22 and 26 are locked due to the bonding formed by the adhesive encasement of the fibers in the first and second coverstock layers 22 and 26, and the continuous z-directional cohesive bond that forms through the scrim apertures 32, as shown in Figure 3C.

10 Another preferred embodiment of the laminate 20 includes a second adhesive 64 (not shown separately in Figures). The second adhesive 64 is preferably applied to the second surface 52 of the elastomeric layer 24, but could alternatively be applied to the first surface 50 of the elastomeric layer 24. The second adhesive 64 is preferably applied in a spiral spray pattern 66, thereby forming bond points 67b that are more discrete than would be formed by a linear spray application. Without being bound by theory, it is believed that most of the second adhesive 64 so sprayed aligns in the structural direction D. Thus, it has been found that spiral spraying results in very good activation properties. As used herein, "activation" refers to the ability to stretch. The second spiral spray pattern 66 and the bond points 67b are shown in Figures 2A and  
15 2B.  
20

It has been found that spraying the layer of second adhesive 64 directly onto the second surface 52 of the elastomeric layer 24 is more preferable than applying the second adhesive 64 to the opposing (i.e., second) coverstock layer 26. This is because  
25 the second adhesive 64 tends to penetrate through any residual processing agents or oils that may remain on the surface of the elastomeric layer 24. Such residual materials, if left to remain on the elastomeric layer 24, may weaken the adhesive bonds and thus the laminate structure 20 over time. For example, if these residual materials are left intact, the bonds used to form the laminate 20 may weaken during the time interval prior to  
30 consumer purchase of the product.

Peel values for the laminate 20 in the spiral adhesive areas are typically higher when the spirals 66 are applied directly to the elastomeric layer 24 than to the opposing (i.e., second) coverstock layer 26. As used herein, the term "peel value" refers to the  
35 amount of force required to separate the two layers of coverstock material, 22 and 26,

from each other. Higher peel values typically equate to less chance of delamination in use.

A third adhesive 60 (not shown separately in Figures) may also preferably be applied to the inner surface 42 of the first coverstock layer 22. Preferably, the third adhesive 60 is an elastomeric adhesive. In a manner similar to that described with reference to the second spiral adhesive application 66, the first adhesive 60 is preferably applied in a spiral spray pattern 62, thereby forming bond points 67a that are more discrete than would be formed by a linear spray application. Without being bound by theory, it is believed that most of the first adhesive 60 so sprayed aligns in the structural direction D. The third spiral spray pattern 62 is shown in Figures 2A and 2B.

Preferably, second and third adhesives 60 and 64 are the same elastomeric adhesive. A preferred adhesive for use in the second and third adhesive spiral sprays 62 and 66 is made by the Findley Adhesive Company under the designation H2120. Preferably, the add-on level for each of the second and third spiral sprays 62 and 66 is about 4 to about 12 milligrams per square inch, more preferably about 8 milligrams per square inch.

20

For ease of manufacture, the laminate structure 20 as shown in Figure 2A may be formed from materials having a total width W, with a perforation line P provided at about the centerline. Thus, after bonding has been performed, the structure may be divided into two sections defined by widths of W1 and W2, shown after perforation in Figure 2B. The perforation line P provides easy separation where the laminate structure 20 will be incorporated into a garment having two side panels, for example a pull-on diaper. It has been found that W equal to about 126 mm and resulting W1 and W2 equal to about 63 mm are suitable for a diaper converting line.

30

The laminate structures 20 of the present invention are highly resistant to both shear and peel forces, and experience substantially no delamination and creep during use. The crystallizing adhesive (e.g., beads 68) at the edges 80 of the laminate structure 20 creates a zone of mechanical lockdown (i.e., side anchor zones A) in the linear region of the edges 80 of the laminate 20. The preferred adhesive pattern described herein permits the construction of a laminate 20 that can stretch up to 200%

with no risk of creep of the elastomeric layer 24 substrate. Creep is measured using a test protocol of pre-stretching the laminate 20 to 200% extension returning and returning it to 100% extension and holding for 24 hours in a 38° C test chamber. Success criteria is considered to be no movement at edges of the laminate 20 for all 5 samples tested. This creep test simulates in-use fatigue by the shearing action of the elastomeric layer 24 during wear. The shearing action is induced by the movement of the wearer, which causes continuous elongation and relaxation cycles from approximately 24% to 150% strain over the wear period. Conventional bonds, such as those with elastic adhesives only, typically fail this creep test.

10

Raw materials and composites using previously known lamination technologies (for example elastic films, Lycra strands, conventional nonwoven coverstock materials, single adhesive systems) have all required trade offs in performance criteria, which has led to sacrifices in at least some of these performance criteria. The preferred laminate 15 structures 20 are substantially free from delamination and creep while also possessing many desirable performance characteristics, without tradeoffs in any performance characteristic category.

For example, stress/strain characteristics of the laminate 20 preferred when 20 incorporating the laminate into a typical disposable pull-on garment include a low application force (i.e., less than about 400 grams per inch at 200% extension, more preferably less than about 250 grams per inch at 200% extension), a high initial contractive force (i.e., greater than about 75 grams per inch at 50% extension), and a high sustained contractive force (i.e., greater than about 60 grams per inch at 50% 25 extension, measurable for 12 hours at 38° C). The preferred laminate 20 further has high-speed activation properties (i.e., about 750 feet per minute), and very good breathability characteristics (i.e., greater than about 4000 MVTR uniformly over entire surface, where MVTR (mass vapor transmission rate is calculated and expressed in g/m<sup>2</sup>/24 hr. using the following formula:

30

$$\text{MVTR} = \frac{\text{Final weight} - \text{initial weight}}{\text{Area of sample in meters} \times 5.0} \times 24.0$$

(time in chamber).

Alternative embodiments for the laminate structure 20 can be formed by 35 locating beads 68 uniformly across the structural direction D of the laminate. This

structure is especially suited for uses in which activation is less demanding and thus the beads 68 need not be confined to the edge regions 30.

Another alternate embodiment provides that the beads 68 are applied so that  
5 they are discontinuous in the structural direction B. The beads may be located as a series of discrete dots. Such dots may be applied in any number of patterns with varying shape frequency of repetition and spacing both in the structural direction B and in the structural direction D.

In still other alternative embodiments, the side anchoring may be achieved by means other than adhesive bead application. Side anchoring may be achieved by mechanical interlocking means such as selectively needle punching, sewing, or hydroentangling the edge regions of the coverstock layers 22, 26 to achieve interlocking of the edge regions 80 through the elastomeric layer apertures 32.  
10 Alternatively, selectively applying heat so that the edge regions 80 of the coverstock layers 22, 26 are fused together to form the side anchor zones A may be performed. Ultrasonic or thermal nipping may alternatively be used to selectively melt and lock the outer edges 80 to form the side anchor zones A. Such are given as examples of alternative preferred edge bonding means and it is to be understood that any suitable  
15 means known to one skilled in the art may be used in connection with the side anchoring of the laminate.

Figure 5 shows a preferred layout for a process for continuous manufacture of an edge bonded laminate structure 20 as described herein. The first coverstock layer 22 is unwound from a first unwind roll 100, preferably at a maximum of about 1% strain and at a web speed of about 300 feet per minute. The first coverstock layer 22 may additionally be passed through first pair of tension rollers 102a, 102b. (It will be understood by those of skill in the art that various other, additional or alternative tension rolls or other processing equipment may be used in connection with the present invention without departing from its scope.) At approximately the same time, the elastomeric layer 24 is unwound from an elastomeric unwind roll 104, preferably at a maximum strain of about 1% and at a web speed of about 300 feet per minute. A release liner roll 106 that cooperates with the elastomeric unwind roll 104 may serve to take up a release liner (not shown) that may be juxtaposed with the elastomeric layer 24 on the elastomeric unwind roll 104 to facilitate elastomeric unwind, i.e., to prevent the  
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elastomeric layer 24 from sticking or otherwise adhering to itself. Such a release liner will typically be discarded.

At the same time that the first coverstock layer 22 and the elastomeric layer 24  
5 are being unwound, the second coverstock layer 26 is being unwound from second  
coverstock unwind roll 112, preferably at a maximum strain of about 1% and at a web  
speed of about 300 feet per minute. The second coverstock layer 26 may additionally  
be passed through a second pair of tension rollers 114a, 114b. (It will be understood  
by those of skill in the art that various other, additional or alternative tension rolls or  
10 other processing equipment may be used in connection with the present invention  
without departing from its scope.)

At least the first adhesive 70 is applied to the inner surface 46 of the second  
coverstock layer 26, preferably in the form of beads 68 (not shown in Figure 5)  
15 positioned at each of the outer edges 80 (not shown in Figure 5) of the second  
coverstock layer 26 and continuous in the structural direction B. The first adhesive 70  
is supplied to a first adhesive applicator 116, which is generally located close enough to  
the second coverstock layer 26 to facilitate the proper adhesive application pattern. A  
bead 68 pattern as described above is preferred. The first adhesive 70 may  
20 alternatively or additionally be applied to the inner surface 42 of the first coverstock  
layer 22. For ease of illustration, the description and Figures refer to application to the  
second coverstock layer 26 only.

The elastomeric layer 24, the first coverstock layer 22 with the first adhesive 70  
25 applied to the edges regions 80 thereof, and the second coverstock layer 26, are  
brought into contact with each other as they are passed between cooperating nipping  
rolls 118a and 118b. As described with reference to Figures 3A-3B, the nipping rolls  
118 cause the contact between the coverstock layers 22 and 26 to join the elastomeric  
layer 24 therebetween, creating the side anchor zones A. Preferably the adhesive beads  
30 68 show through the apertures 32 of the elastomeric layer 24, contacting the first  
coverstock layer 22 and also preferably causing the beads 68 to flow into the fiber  
matrix of the first coverstock layer 22 to create the cohesive z-directional bond. After  
nipping, the finished laminate material 20 may be rolled onto the rewind stand 120,  
where the adhesive is permitted to cure.

In another preferred embodiment, a second adhesive 64 is additionally provided to join at least the elastomeric layer 24 to one of the coverstock layers 22, 26. The second adhesive 64 may also join the first and second coverstock layers 22, 26 to each other. The second adhesive 64 is preferably applied directly to the second surface 52 (not shown in Figure 5) of the elastomeric layer 24 from the second adhesive applicator 110. The second adhesive 64 is supplied to the second adhesive applicator 110, which is generally located close enough to the elastomeric layer 24 to facilitate the proper adhesive application pattern. The second adhesive 64 is preferably applied in a spiral spray configuration at an add-on level of about 4 to about 12 milligrams per square inch, more preferably about 8 milligrams per square inch.

In still another preferred embodiment, a third adhesive 60 is additionally provided to join at least the elastomeric layer 24 to one of the coverstock layers 22, 26. The third adhesive 60 may also join the first and second coverstock layers 22, 26 to each other. The third adhesive 60 is preferably applied to the inner surface 42 of the first coverstock layer 22 (not shown in Figure 5). The third adhesive 60 is supplied to the third adhesive applicator 108, which is generally located close enough to the first coverstock layer 22 to facilitate the proper adhesive application pattern. The third adhesive 60 is preferably applied in a spiral spray configuration at an add-on level of about 4 to about 12 milligrams per square inch, more preferably about 8 milligrams per square inch.

As will be understood by those of skill in the art, process variables such as web speed and adhesive flow rates may be altered. The adhesive application processes may be altered; also, any combination of the adhesives 60, 64 and 70 is possible. For example, gravure or screen printing can be used as the first adhesive applicator 116 to apply an adhesive bead 68 pattern. Additionally, meltblown adhesive, Nordson control coat, or any comparable fiberization process may be used instead of the spiral spray systems to apply the second and third adhesives 60 and 64. Numerous other modifications are possible without departing from the scope of the present invention.

The laminate structure 20 can be incorporated into a variety of products wherein it is desired to provide at least one structural direction that is partially or entirely elastic along its length. Examples of such products include elastic diapers, tape diapers, incontinence products, bandages, body wraps and the like. One particularly preferred

use of laminate structure 20 is as a side panel of a pull-on garment, for example the unitary pull-on diaper shown in Figure 6.

As used herein, the term "pull-on garment" refers to articles of wear which have  
5 a defined waist opening and a pair of leg openings and which are pulled onto the body  
of the wearer by inserting the legs into the leg openings and pulling the article up over  
the waist. The term "disposable" is used herein to describe garments which are not  
intended to be laundered or otherwise restored or reused as a garment (i.e., they are  
intended to be discarded after a single use and, preferably, to be recycled, composted,  
10 or otherwise disposed of in an environmentally compatible manner). A "unitary" pull-  
on garment refers to pull-on garments which are formed of separate parts united  
together to form a coordinated entity, but the side panels are not separate elements  
joined to a separate chassis in that the side panels are formed by at least one layer  
which also forms the central panel or chassis of the garment (i.e., the garment does not  
15 require separately manipulative panels such as a separate chassis and separate side  
panels). The pull-on garment is also preferably "absorbent" to absorb and contain the  
various exudates discharged from the body. Exemplary is the unitary disposable  
absorbent pull-on garment, pull-on diaper 200, shown in Figure 6. As used herein, the  
term "pull-on diaper" refers to pull-on garments generally worn by infants and other  
20 incontinent individuals to absorb and contain urine and feces. It should be understood,  
however, that other pull-on garments such as training pants, incontinent briefs,  
feminine briefs, feminine hygiene garments or panties, and the like, are included  
herein.

25 Figure 6 is a perspective view of an exemplary pull-on diaper. The pull-on  
diaper 200 has an outer surface 220, an inner surface 240 opposed to the outer surface  
220, a front region 260, a back region 280, a crotch region 300, and seams 320 which  
join together the front region 260 and the back region 280 to form leg openings 340  
and a waist opening 360. A continuous belt 380 is formed about the waist opening  
360. The continuous belt 380 acts to dynamically create fitment forces and to distribute  
30 the forces dynamically generated during wear. The pull-on diaper 200 thus preferably  
includes a chassis layer 400; a first belt layer 420; a second belt layer 440; an  
elastically extensible stretch panel positioned in each side panel of the front region 260  
(front stretch panels 460), an elastically extensible stretch panel positioned in each side  
35 panel of the back region 280 (back stretch panels 480), and an elastic waist feature 500

positioned in both the front region 260 and the back region 280. The pull-on diaper 200 additionally comprises elastic leg features 520. Because the first belt layer 420 and the second belt layer 440 (the belt layers) are preferably nonwoven webs having the appearance of cloth and the chassis layer 400 is preferably a plastic film, the pull-on diaper 200 has a unique aesthetic feature in that it is perceived by caregivers and wearers to have a garment-like comfort and feel in the waist regions while having a perceived containment benefit in the crotch region. Such a pull-on diaper is disclosed in U.S. Patent No. 5,569,234 to Buell et al., which is incorporated by reference herein in its entirety.

10

The front stretch panels 460 and the back stretch panels 480 are unitary elements of the pull-on diaper 200 (i.e., they are not separately manipulative elements secured to the pull-on diaper, but rather are formed from and are extensions of one or more of the various layers (at least the belt layers 420, 440 and preferably also the chassis layer 400) of the pull-on diaper 200.) In a preferred embodiment, each stretch panel is formed by a portion of the chassis layer, a portion of the respective belt layer, an elastic panel member positioned between the chassis layer and the belt layer, and a portion of the barrier layer.

20

The belt 380 is elastically extensible in the side panels 460 and 480 to provide a more comfortable and contouring fit by initially conformably fitting the pull-on diaper 200 to the wearer and sustaining this fit throughout the time of wear well past when it has been loaded with exudates by distributing forces along both the waist and legs since the sides of the pull-on diaper 200 can expand and contract. The side panels 460 and 25 480 are extensible in at least one direction, preferably in a direction having a vector component in the lateral direction, more preferably in the lateral direction, to provide better fit. It should be noted, however, that the side panels 460 and 480 may be extensible in any other direction or in more than one direction. In addition, the side panels may have one or more discrete zones of extensibility.

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Elastically extensible stretch panels (front stretch panels 460 and back stretch panels 480) are formed in each side panel of both the front region 260 and the back region 280. As used herein, the term "panel" denotes an area of element of the pull-on diaper or belt. Figure 7 illustrated a sectional view of the front region 260 of the 35 diaper 20. Each front stretch panel 460 at least comprises the portion of the first belt

layer 420 in the side panel and a laminate member 20 according to the present invention joined thereto, and, in this particular illustration, the portion of the chassis layer 400 forming the side panel. Preferably, the laminate member 20 is positioned between the chassis layer 400 and the first belt layer 420, and more preferably extends longitudinally from the end edge 700, most preferably to the leg edge 710 (shown in Figure 6). Use of a laminate structure 20 according to the present invention is highly preferred.

Although Figure 7 shows only a sectional view of the front region 260 of the pull-on garment 200, the back region 280 is similarly constructed. Each rear stretch panel 480 at least comprises the portion of the second belt layer 440 in each side panel and a (rear) laminate member 20' (not shown) joined thereto, and, in this particular embodiment, the portion of the chassis layer 400 forming the side panel. Preferably, the (rear) laminate member 20' is positioned between the chassis layer 400 and the second belt layer 440, and more preferably extends longitudinally from the end edge 700' (not shown), most preferably to the leg edge 710' (not shown).

As shown in Figure 6, the chassis layer 400 is shown to form the primary strata or layer of the pull-on diaper 200 and has an inner surface 760 and an outer surface 770. The first belt layer 420 is positioned on the outer surface 770 of the chassis layer 400 to form the outer surface 220 of the pull-on diaper 200 in the front region 260. The laminate members 20 are preferably positioned between the first belt layer 420 and the chassis layer 400. The topsheet 800 preferably comprises a liquid pervious primary layer 860 and two barrier layers 880. The barrier layers 880 extend laterally outwardly from the primary layer 860 to the side edges 720. Each barrier layer 880 comprises a flap portion 90 and a stand-up portion 920 to stand up away from the surface of the primary layer 860 to form a barrier or wall in use. The flap portion 900 extends laterally outwardly from the stand-up portion 920 to the side edge 720. The absorbent core 840 is preferably positioned between the primary layer 860 and the chassis layer 400. The construction of the back region is preferably identical to the construction of the front region 260.

The laminate member 20 can be operatively joined in the stretch panels 460 to the chassis layer 400, the belt layers 380, or both, using either an intermittent bonding configuration or a substantially continuous bonding configuration. As used herein, an

"intermittently" bonded laminate web means a laminate web wherein the plies are initially bonded to one another at discrete spaced apart points or a laminate web wherein the plies are substantially unbounded to one another at discrete spaced apart areas. Conversely, a "substantially continuously" bonded laminate web means a laminate web wherein the plies are initially bonded substantially continuously to one another throughout the areas of interface. Such methods are described, e.g., in U.S. Patent 3,860,003 entitled "Contractile Side Portions For A Disposable Diaper" issued to Buell on January 14, 1975, WO 95/03765, "Web Materials Exhibiting Elastic-like Behavior", The Procter & Gamble Company, published February 9, 1995, each of which is incorporated herein by reference. Alternatively, the laminate member and any other components of the stretch panel may be intermittently or continuously bonded to one another using heat bonding, pressure bonding, ultrasonic bonding, dynamic mechanical bonding, or any other method as is known in the art.

It has been found that the extension characteristics including the extension forces, extension modulus, and available stretch (extension); and the contractive forces and rate of contraction of the stretch panels are important considerations in the performance of both the stretch panels and the pull-on diaper. The extension properties and fitment forces give the applicator and the wearer the overall perceived "stretchiness" during use. They also effect the ability of the applicator to achieve a suitable degree of application stretch (i.e., for a "normally" perceived tensioning of the diaper during application, the total amount of resultant stretch is that desired to achieve/maintain good conformity of fit). A stretch panel with a relatively high extension modulus/force can cause red marking on the wearer's skin while a relatively low extension modulus/force can cause sagging/slipping on the wearer. Stretch panels having too little available stretch may not achieve a suitable level of body conformity and may contribute in making the diaper uncomfortable to wear and hard to put on. Stretch panels with very low contractive forces (or excessive elastic creep, excessive elastic force relaxation, or excessive inelastic "set") may not stay in place on the wearer and may tend to sag/slip on the wearer resulting in poor fit and containment. Incorporation of laminate structures 20 of the present invention into the side panels 460 and 480 of the pull-on diaper 20 achieve a high level of body conformity while substantially eliminating sag and slip.

The pull-on diaper 200 can be applied by a caregiver or be self-applied by the

wearer. Typically, the waist opening 360 will be expanded to allow the wearer to insert one foot into one of the leg openings 340. The other foot is then inserted into the other leg opening 340. The pull-on diaper 200 is then pulled up over the torso of the wearer into its wearing position. The force wall created by side panels 460, 480 that incorporate the laminate structures 20 of the present invention especially assists in self application of the pull-on diaper by forcing the product to be pulled up over the buttocks rather than further expanding. The pull-on diaper is then worn and can contain and hold discharged body exudates. The pull-on diaper is removed from the wearer by either pulling it back down over the legs or tearing the portions of the pull-on diaper adjacent the seams.

For form-fitting garments such as the pull on diaper 200, the breathability and the circumferential forces of the garment are important to performance, especially in hot and humid conditions. When an absorbent article is placed on a wearer, the skin is occluded by the materials making up the garment, which prevents evaporation and resultant cooling of the occluded area. This in turn results in less comfort for the wearer. Thus, sufficient moisture vapor transmission in the side panels is a desirable performance characteristic. Exemplary side panels 460 and 480 having a desirable weighted average mass vapor transmission rate include a laminate structure 20 according to the present invention.

It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to one skilled in the art without departing from the scope of the present invention.

What is claimed is:

1. A laminate structure elastically extensible in at least one direction, comprising:

a first coverstock layer;

5 a second coverstock layer; and

an elastomeric layer joined between the first and second coverstock layers and along edge regions thereof to provide side anchor zones along edge regions of the laminate structure.

2. The laminate structure of claim 1 wherein the side anchor zones are created by mechanically interlocking the edge regions of the first and second coverstock layers.

3. The laminate structure of claim 2 wherein the mechanical interlocking comprises means selected from the group consisting of needle punching, sewing or hydroentangling.

4. The laminate structure of claim 1 wherein the side anchor zones are created by selectively applying heat to the edge regions of the first and second coverstock layers so that the edge regions thereof are fused to form the side anchor zones.

5. The laminate structure of claim 1 wherein the side anchor zones are created by means selected from the group consisting of ultrasonic nipping or thermal nipping, wherein the edge regions of the first and second coverstock layers are fused to form the side anchor zones.

6. A laminate structure elastically extensible in at least one direction, comprising:

a first coverstock layer having an inner and an outer surface;

5 a second coverstock layer having an inner and an outer surface; and  
an elastomeric layer joined between the first and second coverstock

layers by at least a first adhesive;

10 wherein the first adhesive is applied to edge regions of the inner surface of at least one of the coverstock layers to provide side anchor zones along edge regions of the laminate structure.

7. The laminate of claim 6 wherein the first adhesive has an amorphous and crystallizing component such that the first and the second coverstock layers are cohesively joined.
8. The laminate of claim 7 further comprising a second adhesive joining at least one of the coverstock layers to at least the elastomeric layer.
9. The laminate of claim 8 further comprising a third adhesive joining at least the other of the coverstock layers to at least the elastomeric layer.
10. The laminate of claim 6 wherein the elastomeric layer is selected from the group consisting of an elastomeric scrim, a perforated film, or elastic strands.
11. The laminate of claim 10 wherein each of the coverstock layers comprises a consolidated nonwoven web.
12. The laminate of claim 9 wherein the each of the second and third adhesives is an elastomeric adhesive, the second adhesive being applied to the elastomeric layer in a spiral spray pattern and the third adhesive being applied to the inner surface of the other of the coverstock layers in a spiral spray pattern.
13. A laminate structure elastically extensible in at least one direction, comprising:
  - a first coverstock layer having an inner and an outer surface;
  5. a second coverstock layer having an inner and an outer surface; and
  - an apertured elastomeric layer joined between the first and second coverstock layers at least a first adhesive;

10 wherein the first adhesive is applied as a plurality of discrete beads to edge regions of the inner surface of at least one of the coverstock layers to provide side anchor zones along edge regions of the laminate structure, and

15 wherein the first and second coverstock layers are joined by cohesive bonds that form through the apertures of the elastomeric layer.

14. The laminate of claim 13 further comprising a second adhesive joining at least one of the coverstock layers to at least the elastomeric layer.
15. The laminate of claim 14 further comprising a third adhesive joining at least the other of the coverstock layers to at least the elastomeric layer.
16. A laminate structure elastically extensible in at least one direction, wherein edge regions of the laminate structure are provided with side anchor zones and wherein the stress/strain characteristics of the laminate comprise an application force of less than about 400 grams per inch at 200% extension and a sustained contractive force of greater than about 60 grams per inch at 50% extension.  
5

17. A unitary disposable absorbent article having a front waist region and a back waist region, comprising:

5 a main panel comprising a liquid pervious topsheet, a liquid impervious backsheet joined with the topsheet, and an absorbent core positioned between the topsheet and the backsheet;

10 a pair of extensible leg cuffs, each extensible leg cuff having a leg flap panel joined to and extending laterally outwardly from the main panel;

a continuous belt feature positioned in the front and back waist regions, the continuous belt feature having:

15 a waistband panel joined with and extending longitudinally outwardly from the main panel and being extensible in a lateral direction ; and

a pair of elastically extensible side panels joined with and extending laterally outwardly from at least a portion of the waistband panel, each

side panel including a laminate structure elastically extensible in at least one direction, the laminate structure comprising:

20 a first coverstock layer;

a second coverstock layer; and

an elastomeric layer joined between the coverstock layers and along edge regions thereof to provide a side anchor zone along the edge regions of the laminate structure.

25 18. A unitary disposable absorbent article having a front waist region and a back waist region, comprising:

5 a main panel comprising a liquid pervious topsheet, a liquid impervious backsheet joined with the topsheet, and an absorbent core positioned between the topsheet and the backsheet;

a pair of extensible leg cuffs, each extensible leg cuff having a leg flap panel joined to and extending laterally outwardly from the main panel;

10

an continuous belt feature positioned in the front and back waist regions,  
the continuous belt feature having:

a waistband panel joined with and extending longitudinally outwardly from the main panel and being extensible in a lateral direction ; and

15

a pair of elastically extensible side panels joined with and extending laterally outwardly from at least a portion of the waistband panel, each side panel including a laminate structure elastically extensible in at least one direction, the laminate structure comprising:

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a first coverstock layer having an inner and an outer surface;

a second coverstock layer having an inner and an outer surface;

an elastomeric layer joined between the coverstock layers by at least a first adhesive;

25

wherein the first adhesive is applied to edge regions of the inner surface of at least one of the coverstock layers to provide a side anchor zone along the edge regions of the laminate structure.

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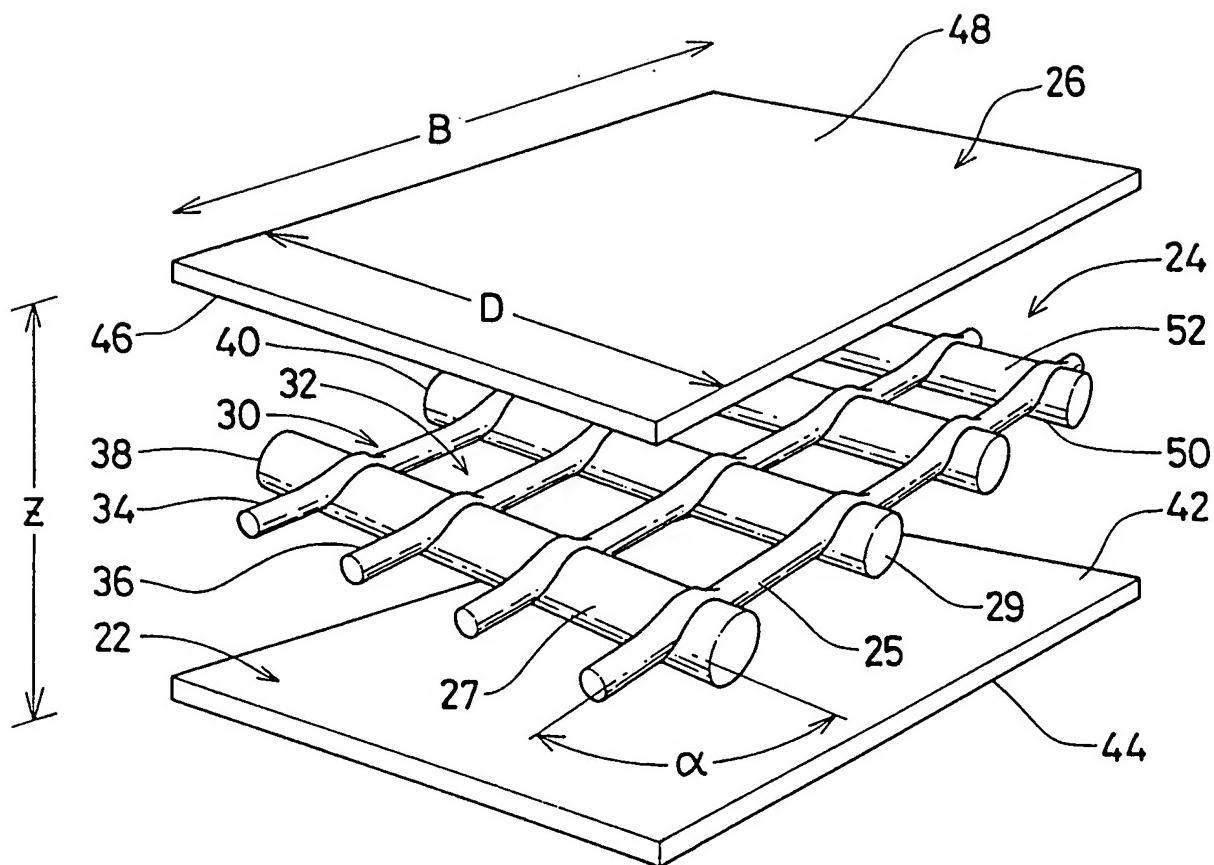


Fig. 1

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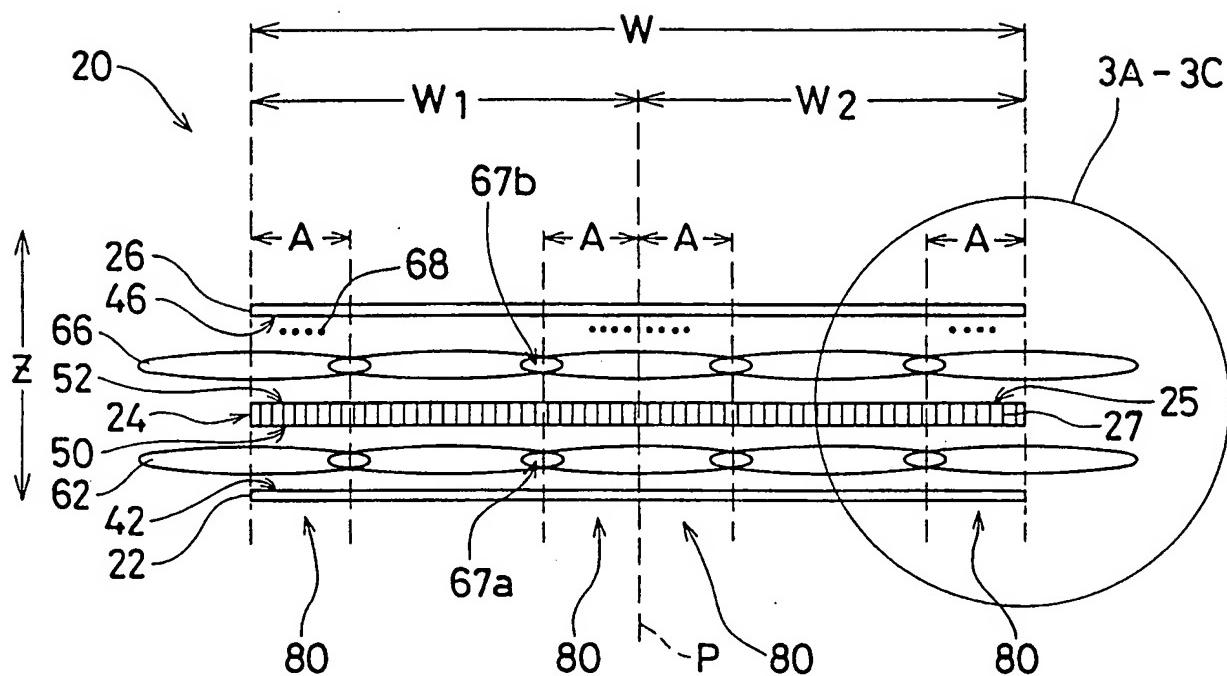


Fig. 2A

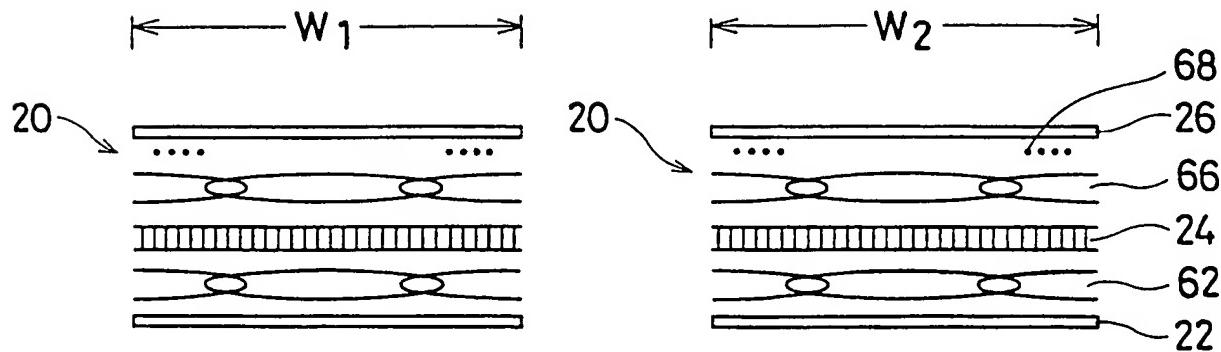


Fig. 2B

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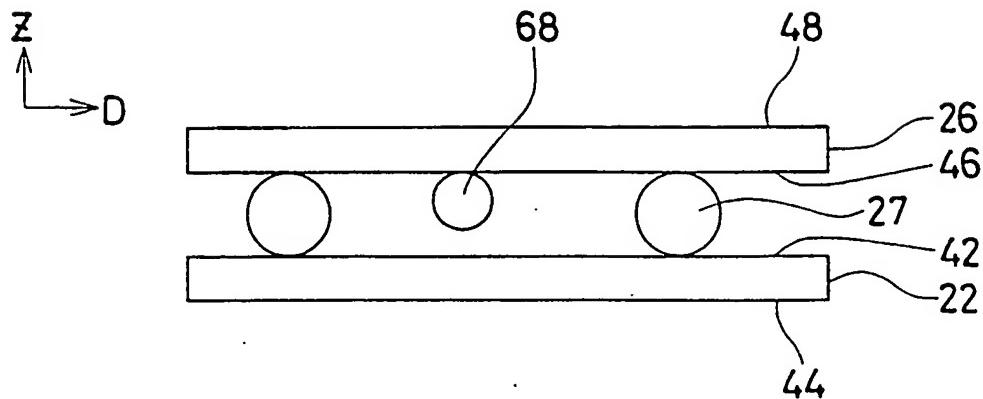


Fig. 3A

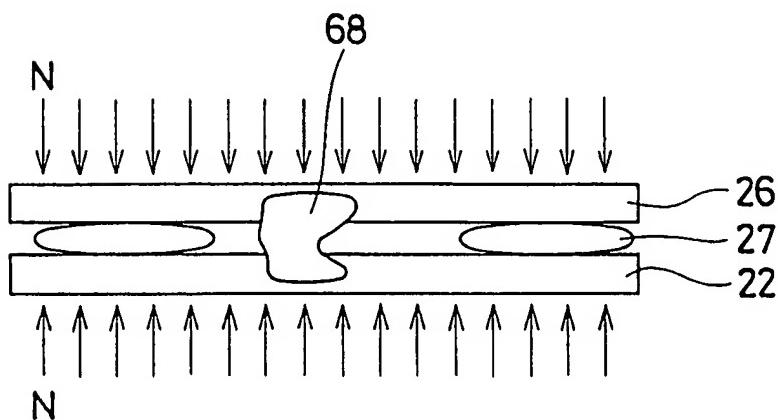


Fig. 3B

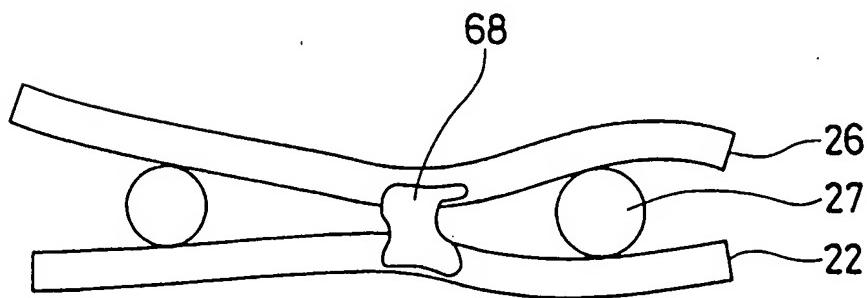


Fig. 3C

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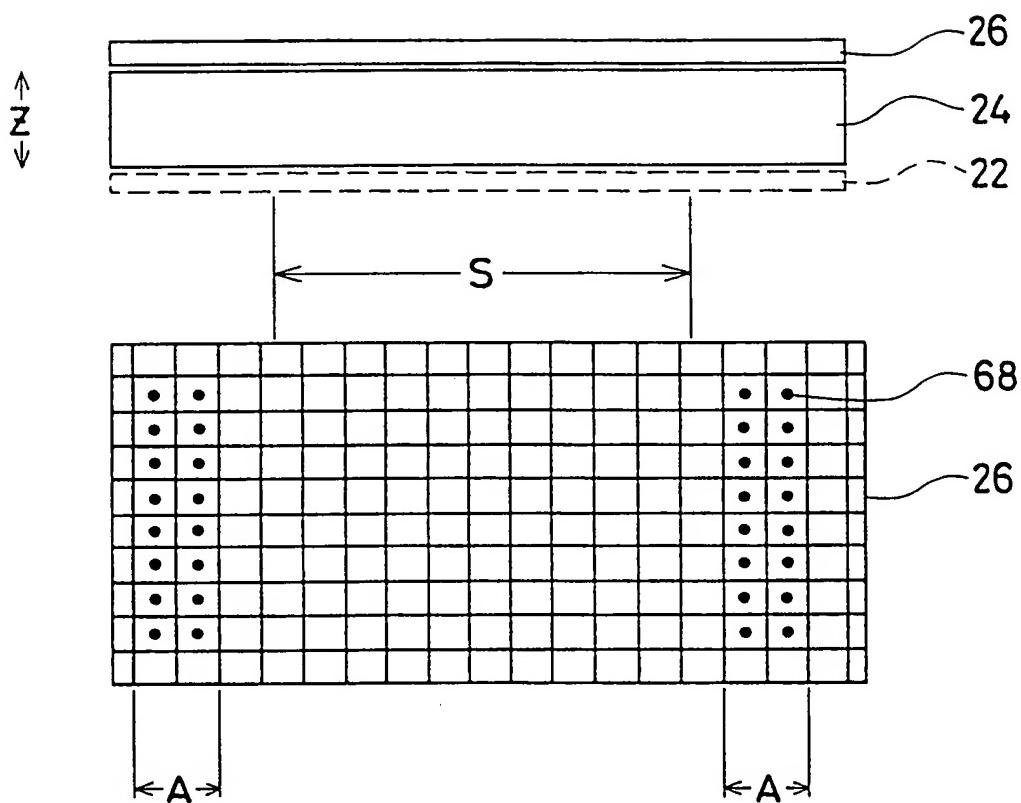


Fig. 4

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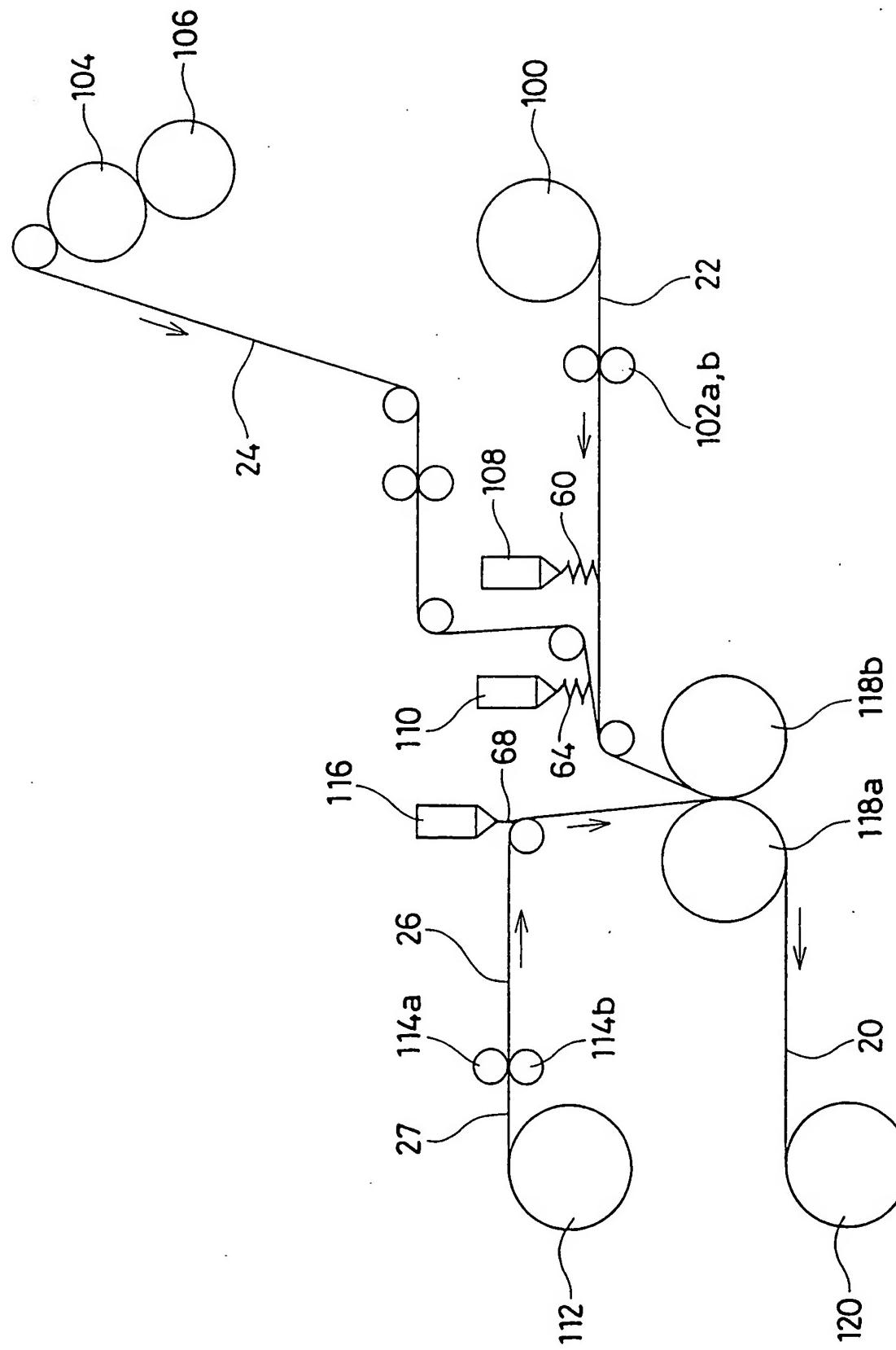


Fig. 5

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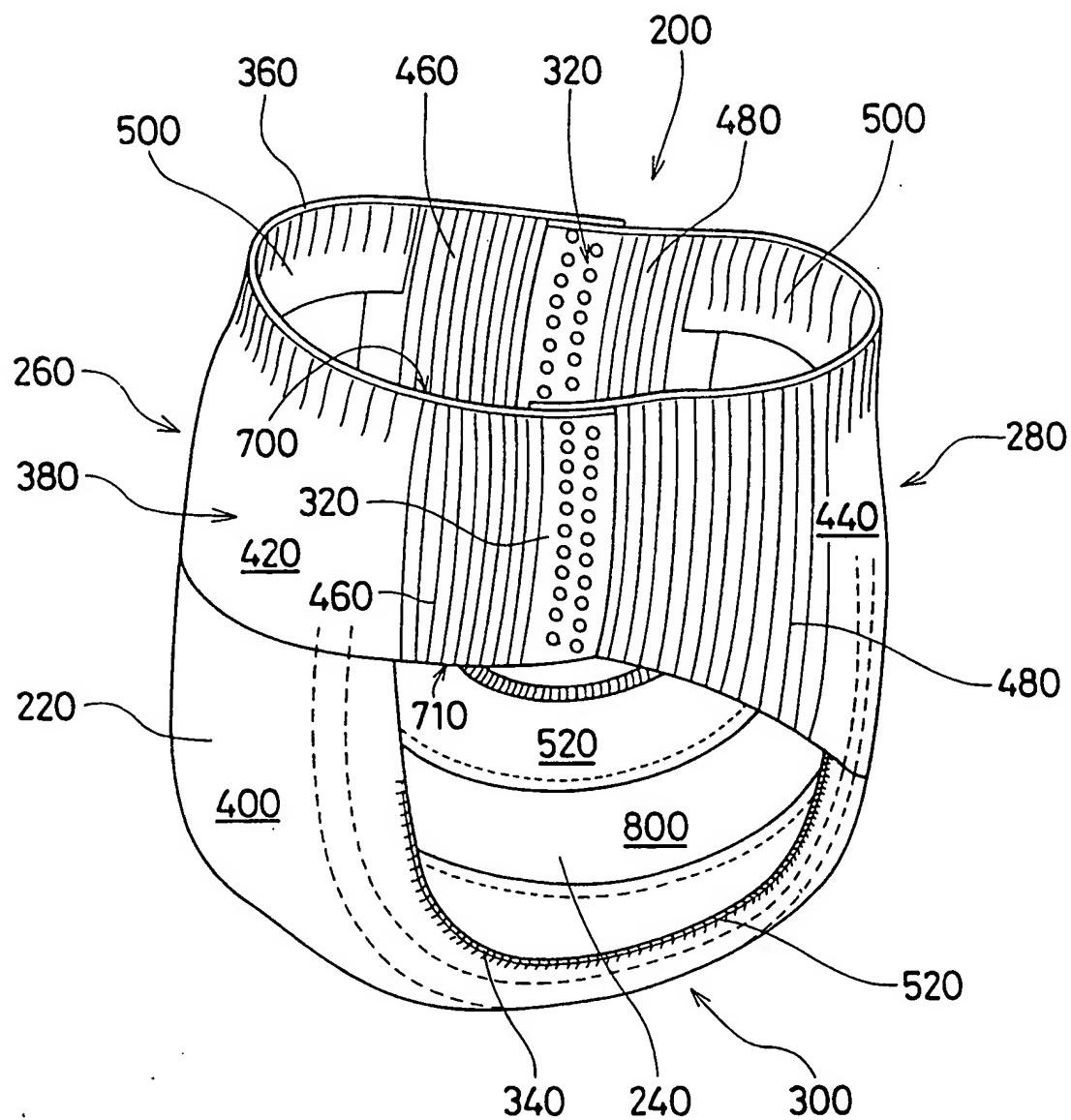


Fig. 6

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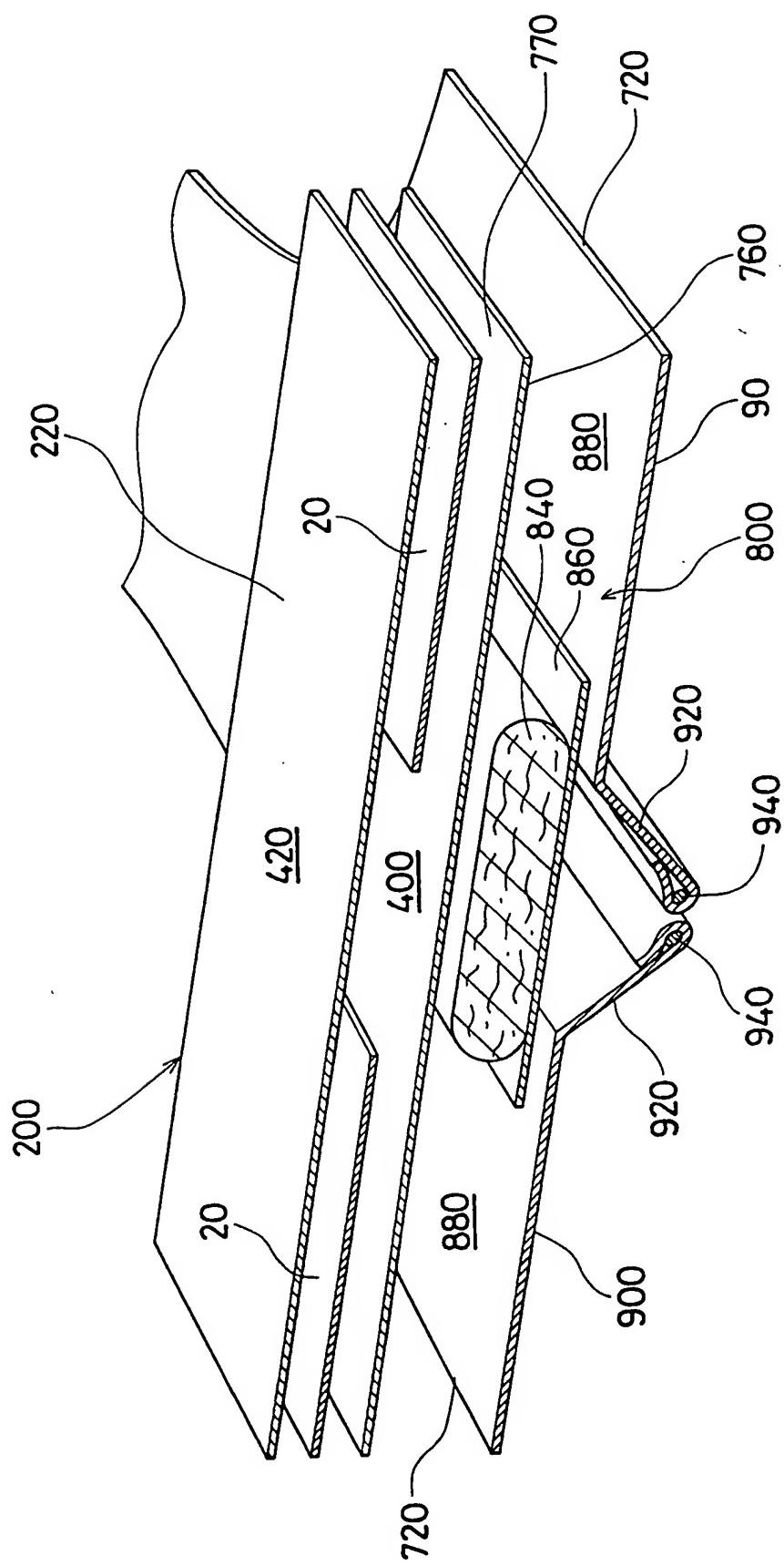


Fig. 7

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 B32B7/04 A61F13/15 B32B3/10

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 6 B32B A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 19258 A (PARAGON TRADE BRANDS INC ;SUZUKI MIGAKU (JP)) 20 July 1995 see abstract see page 7, line 18 - line 27 see page 10, line 19 - line 25 see page 9, line 9 - line 31 see page 11, line 13 - line 18 see page 12, line 1 - line 28 see page 13, line 22 - line 32 see page 13, line 37 - page 14, line 7 see figures 10A-15,17	1-5,16
Y	--- -/- ---	6,10,11, 13,17,18

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

2

Date of the actual completion of the international search

26 January 1998

Date of mailing of the international search report

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Name and mailing address of the ISA

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Authorized officer

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International Application No

PCT/US 97/09943

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